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CONTENTS

QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

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SCIENCE

NEW YORK, JANUARY 5, 1894.

RIVER COURSES IN THE JURA MOUNTAINS.

BY EMM. DE MARGERIE, PARIS, FRANCE.

It is well known to readers of *Science* that Prof. W. M. Davis, in his admirable analysis of the origin of the Valleys of Pennsylvania (National Geogr. Mag., Vol. I., No. 3, 1889), started from the assumption of a purely consequent, original course for the rivers which have excavated most of the Appalachian Valleys. As an illustration of such a kind of drainage system existing at the present time the Jura Mountains were given, following a statement published by Col. de la Noë and myself in our joint work, "Les Formes du Terrain" (Paris, 1888).

More recently, however, Prof. Davis has been led to change this view, according to the results reached by Mr. Aug. F. Foerste, in his valuable account of "The Drainage of the Bernese Jura" (Proc. Boston Soc. Nat. Hist., Vol. XXV., p. 392–420, 1892).

While admitting that Mr. Foerste has clearly shown that the River Birse could not have taken its present path if it had been a purely original consequent stream, I cannot agree with him when he endeavors to show that recourse must, *of necessity*, be had to the postulate of an antecedent origin; for it seems highly improbable that such a small river, whose upper drainage area is of so little extent, could have victoriously reinted the uplift of such great anticlinals as the Graitery, the Raimeux, the Roche and the Choindez folds are. The failure of other explanations to meet the facts, which is given by Mr. Foerste, together with the systematic arrangement of several series of *cluses* in straight lines, as the main support of the theory of an antecedent origin (loc. cit., p. 411), does not seem to constitute a valid argument: are we absolutely certain not to have overlooked some possibility, which could turn out, when followed out in detail, to involve the true explanation?

But, apart from these considerations, if such is really the origin of the *Cirques* followed by the Birse, we should expect to find in the Jura Mountains many other examples of the same absence of relation between river-courses and constructional form. In order to test in a definite manner the validity of Mr. Foerste's conclusions, and to see whether his theory may be of general application in the Jura or not, my friend, Col. de la Noë, has lately drawn, at my request, a large map of the whole country between Bâle, on the Rhine, and Belley, near the Rhone, a map upon which all the heights have been referred to a common datum plane (in a stratigraphical sense), viz.: the limit between the uppermost Jurassic beds and the base of the Cretaceous (Neocomien); as a basis for the work, use was made of the sheets of the new map of France, drawn in contours with 20 metres vertical interval on the scale of 1:200,000, geological boundaries being adjusted on the same from the detailed maps of the French and Swiss Surveys. The altitude reached at any point by the horizon selected, above the present surface, if denuded, or underground, if covered by more recent deposits, could be computed with a fair degree of approximation, thanks to the numerous measurements of sections published during the last decade for various parts of the Jura; contours were then constructed, every 100 metres apart, without any regard to the present topography, and a photographic proof of the map, reduced one-half, colored in the manner of an ordinary hypsometric map.[1]

The result is very striking: nearly everywhere a strict accordance is shown to exist between the actual courses of rivers and the distribution of the lowest parts of the constructional surface; the larger streams, those which might be expected to exhibit the most irregular courses if the assumption of an antecedent origin was correct, are precisely those which follow the most closely synclinal depressions, making use here and there of *cols* where anticlinal arches are locally lowered in a transverse direction. Such is the case for the river Ain, the longest among the tributaries which the Rhone receives from the Jura, and for the Doubs, the longest stream in the whole region. A beautiful illustration of a series of *cluses* arranged in a straight line, and demonstrably correlated with the lowering of several adjacent anticlines from both sides, is given by the river Bienne, between the town of St. Claude and its junction with the Ain. Many other cases might be pointed out to the same effect, viz.: that the Jura drainage, as a whole, is typically consequent upon the deformations, and that, accordingly, Professor Davis was quite right in postulating as the initial stage, in the development of Pennsylvania rivers, essentially original courses during Permian time.

As to the special case of the Birse, no doubt that apparent exception remains to be explained; that backward erosion may have been concerned in the production of the Bernese *Cirques*, Mr. Foerste himself seems to concede, in alluding to the Crémine cirque; and I believe nobody can have seen the Soulce depression, on the outside of the Choindez fold, or the great ravine south of Châtillon, a little more to the east, without being struck by the analogy of both features with an unperfected *cluse*—and their purely regressive origin is beyond question.

A last word about the crystalline pebbles in the Tertiaries of the Bernese Jura: Mr. Foerste, following J. B. Greppin, believes that they came from the Schwartzwald, to the north of the district. But that conclusion is far from certain. Dr. Rollier, who has carefully surveyed the district on the scale of 1:25,000,

[1] The method here described does not seem to have been, as yet, appreciated to its full value. Originated, I believe, in America, with Professor Lesley's efforts, and splendidly applied to the study of the anthracite fields of Pennsylvania by his lamented assistant, the late Charles A. Ashburner, it has been but little resorted to, outside of very limited districts and for purely scientific purposes. So far as I am aware, the only similar attempts yet made to construct in contour-lines stereograms of displacements, for a broad geographical area, are Mr. Dollfus's "Carte hypsometrique de la Surface de la Craie dans le Bassin de Paris," on the scale of 1:1,000,000, published in Bulletin No. 14 of the French Geological Survey (Paris, 1890), and the two maps illustrating the shape of the Trenton limestone in Ohio and Indiana, published by Professor Orton and Mr. Phinney in the Eighth and Eleventh Annual Reports of the United States Geological Survey, respectively. I myself constructed, several years ago, a contour map, still unpublished, showing the deformations of the Dakota sandstone in western Colorado (from Hayden's atlas of that state), and where the same agreement between structure and hydrography as is here advocated for the Jura was plainly exhibited. The construction of such maps would be specially fitting in those countries where detailed geological surveys are conducted upon topographical maps in contours as a basis, such as are in most parts of Germany.

when conducting five years ago the Swiss Geological Society on the ground, expressed the opinion, then endorsed by Professor Gutzwiller and Professor Baltzer, that the pebbles, at least in part, came, on the contrary, from the south and were of Alpine origin;[2] and it may be well to recall that such was also Studer's opinion.[3] It would make the case very different, in so far as several of the paleo-geographical conclusions of Mr. Foerste are concerned.

INDIANA ACADEMY OF SCIENCE.

THE ninth annual meeting of the Indiana Academy of Science was held in the capitol at Indianapolis, Dec. 27 and 28, 1893, under the presidency of Dr. J. C. Arthur, of Purdue University. The morning of Wednesday was devoted to a discussion of the proposed biological survey of Indiana. The directors having the survey in charge first presented reports of their respective divisions. Dr. L. M. Underwood, Division of Botany; Dr. C. H. Eigenmann, Division of Zoölogy; Prof. V. F. Marsters, Division of Palæontology. For some time there has been under discussion a plan for several states to coöperate in the work of such a survey; This matter was taken up, and Dr. J. M. Coulter, of Lake Forest, Ill., spoke for that state. Prof. R. E. Call represented Kentucky. Several of the workers on the Indiana Survey spoke on various phases of the work. "Phænerogams," discussed by Prof. Stanley Coulter; "Fishes," Dr. C. H. Eigenmann; "Plans for Successful Work," Dr. J. M. Coulter; "What Can the High Schools Do to Help the Survey?" Prof. W. S. Blatchley. "Can the Common Schools Aid?" Prof. W. W. Norman; "Mollusks," Prof. R. E. Call; "Palæontology," Prof. V. F. Marsters; "Ornithology," A. W. Butler. The discussion occupied the full half-day.

In the afternoon the Academy met in two sections, one devoted to botany and zoölogy, the other to chemistry, physics and mathematics. In the former the following papers were presented: "An Alphabetical and Synonymical Catalogue of the Acrididæ of the United States," W. S. Blatchley; "On the Hibernation of Turtles," A. W. Butler; "Some Notes on a Variety of *Solanum Dulcamara*," R. Wes. McBride; "Indiana Fishes," C. H. Eigenmann; "Review of Botanical Work in Indiana with Bibliography," L. M. Underwood; "Notes on an Imbedding Material," John S. Wright; "Recent Notes on Indiana Birds," A. W. Butler; "The Distribution of Indiana Birds," A. W. Butler; "On the Occurrence of the Rarest of the Warblers (Dendroica Kirtlandi) in Indiana," A. B. Ulrey; "Histology of the Pontederiaceæ," E. W. Olive; "Growth in Length and Thickness of the Petiole of *Richardia*," Katherine E. Golden; "The Geographical and Hypsometrical Distribution of North American Viviparidæ," R. Ellsworth Call; "Recent Notes on Cacti," J. M. Coulter; "The Field Columbian Museum," J. M. Coulter.

In the physico-chemical section were presented: "Estimation of Organic Matter in Water by the Potassium Permanganate Method," Thos. C. Van Nuys and Sherman Davis; "1. 4. Di-amino-cyclo-hexane," W. A. Noyes and H. H. Ballard; "Preliminary Note on Variations of Strength of Timber in Different Parts of the Cross Section of the Tree," Thomas Gray; "A Method of Determining Traces of Cyanogen in Organic Matter," Sherman Davis; "Integration of a Linear Vector Differential Equation," A. S. Hathaway; "An Autographic Method of Testing the Magnetic Qualities of Iron," Thomas Gray; "A Case of Stereo-isomerism in the Hydrazones of Benzoin," Alexander Smith; "Camphoric Acid," W. A. Noyes; "The Value of the Steam Pipe within the Smoke Box of a Locomotive, as a Means of Superheating," Wm. F. M. Goss; "An Experimental Study of the Action of the Counterbalance in Locomotive Drive-Wheels," Wm. F. M. Goss; "Methods of Starch Determination," W. E. Stone and D. B. Hoffman; "The Combustion Gases of the Locomotive," W. E. Stone.

Wednesday evening the Academy met in general session. The following officers were elected for the ensuing year: President, W. A. Noyes, Terre Haute; Vice President, A. W. Butler, Brookville; Secretary, C. A. Waldo, Greencastle; Assistant Secretary, W. W. Norman, Greencastle; Treasurer, W. P. Shannon, Greensburg. President Arthur then addressed the Academy on "The Special Senses of Plants."

Thursday morning the early part of the session was devoted to the reports of committees. A change was made in the constitution of the Academy providing for a body of fellows. The following papers were then presented: "Should the Study of Natural Science in the Lower Classes of the Public Schools be Encouraged?" W. W. Norman; "The Detection of Strychnine in an Exhumed Human Body," W. A. Noyes; "Absorption of Poisons by Animal Tissue After Death," P. S. Baker; "The Application of Graphical Methods to the Solution of Some Problems in Electrical Engineering," Harold B. Smith; "Induration of Certain Tertiary Rocks in Northeastern Arkansas," R. Ellsworth Call; "The Effect of Environment on the Mass of Local Species," C. H. Eigenmann.

At the afternoon session the following papers were offered: "The White Clays of Southern Indiana," A. W. Butler; "The Ash of Trees," Mason B. Thomas; "Poisonous Influence of *Cypripedium spectabile*," D. T. MacDougal; "Notes on the Biological Survey," Mason B. Thomas; "Notes on Sectioning Woody Tissues," John S. Wright; "The Stomates of Cycas," Mason B. Thomas; "Symbiosis in Isopyrum Biternatum," D. T. MacDougal; "Our Present Knowledge of the Distribution of Pteridophytes in Indiana," Lucien M. Underwood; "Concerning the Effect of Glycerine on Plants," John S. Wright; "The Adventitious Plants of Fayette County," Robert Hessler; "Bibliography of Indiana Ornithology," A. W. Butler; "Bibliography of the Batrachians and Reptiles of Indiana," O. P. Hay; "Bibliography of Indiana Mammals," A. W. Butler and B. W. Everman; "The Effect of Light on the Germinating Spores of Marine Algæ," Melvin A. Brannon; "Notes on Saprolegnia," George L. Roberts; "Contributions to the Life-History of Notothylas," D. M. Mottier; "Some South American *Characinidæ*, with Six New Species," A. B. Ulrey.

The Academy decided to hold its next meeting in May at Rochester, Indiana, where, in connection with the meeting, an exploration of some of the beautiful lakes in that vicinity can be undertaken.

—Diana Clifford Kimber will soon publish a text-book on "Anatomy and Physiology for Nurses," in connection with Louise Darche. Miss Kimber's experience as assistant superintendent in both the New York City and the Illinois Training School for Nurses has led her to feel the need of such a manual and to undertake the work. It is designed to fill a middle place between the text-book written for medical students and that for use of children in schools. The subject is presented in a scientific manner, but the technicalities which discourage the average student have been, so far as possible, avoided.

[2] See Eclogæ Geologicæ Helvetiæ, 1888, No. III., p. 281.
[3] See L. Rollier, Etude stratigraphique sur les terraine tertiaire du Jura Bernois (Archives des Sc. Phys. et. Nat., March, 1892).

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THE CRUISE OF THE CLOVER—FURTHER REMARKS ON THE ABERRATIONS OF AUDIBILITY OF FOG SIGNALS—THE METHODS USED.[1]

BY ARNOLD BURGES JOHNSON, WASHINGTON, D. C.

IT is now about a quarter of a century since Prof. Joseph Henry, the first President of this society, commenced his investigation into the operations of the laws of sound in connection with the fog signals used by the Light House Board, of which board he was then the scientific member.

When I was made Chief Clerk of the Light House Board in 1869 it became my duty, as well as a privilege which I highly prized, to act to a certain extent as his amanuensis and aid in putting the results of his experiments in the form of reports to the Light House Board. In this way I became interested in this work and was, in a very humble way, associated with Professor Henry in its prosecution. Thus I entered with him into a practical discussion of the subject and became, after a fashion, possessed of his views as to the best way to follow up the investigation. I thus came to know something of his tentative plans and of his desire to make very practical use for light house purposes of the outcome of the investigations.

On Nov. 6, 1880, the great Long Island Sound steamer Rhode Island was stranded and finally lost on Bonnet Point in Narragansett Bay. Then, putting it roughly, a million in property was lost and thousands of lives were imperilled. The master and pilot of the steamer claimed that the fog-signal at Beaver Tail Point, about one and seven-eighths miles away, was not sounding at the time of the accident; and hence the casualty. The light keeper who was in charge of the fog-signal at the time, and who was in peril of losing his place, proved conclusively that at the time of the wreck the sound of the fog-signal was heard at Newport, five miles away, at Fort Adams, four and a quarter miles away in one direction, and at Narragansett Pier, four and a half miles away in another direction. The steamer people, who were in danger of forfeiting their licenses, came back with affidavits of many on board that they were anxiously listening for the fog-signal, and that it was not in operation, for they did not hear its sound.

Then the Light House Board took a hand in the matter. It had been shown by Professor Henry that, although a sound could be heard at a certain distance from its source, it might not be heard in the same direction, and at the same time, at a less distance. Could this be one of those cases? A naval officer in the service of the board, now ranking as a Commodore, was sent to the locality to find out. He had the fog-signal at Beaver Tail started, and cruised round it in a sail boat for some time, taking constant note of the intervals of the sound. He found, and reported to everybody's surprise, that not only did he fail to get the sound of the Beaver Tail fog-signal at Bonnet Point, one and seven-eighths miles away, where the Rhode Island was lost, but he failed to get it at other points even nearer to the fog-signal, while he heard it on the same day at different points farther away, and much farther away in a line with the nearer points where he could not hear it. This settled the question. The light keeper was relieved from the charge of failing to have the fog-signal in operation, and the steamer people were relieved from the charge of failing to act on the warning of the fog-signal, which was blowing, but which, while within earshot, they might not hear.

In 1881 the great propeller Galatea, while on the way from New York to Providence, ran onto Little Gull Island in Long Island Sound, imperilling many lives and much property. There was, and is, on that island, which is but one-eighth of a mile long, a powerful light and a powerful fog-signal. That fog signal has been often heard sixteen miles away. The defense of the steamer people was that the fog was dense and that the fog-signal was not blowing. The light-keeper, in his defense, showed that the fog-signal was blowing, that it was heard and noted at several different points in different directions, say at New London, Mystic, and at several light houses, many miles away, at the very time the Galatea ran on the little islet on which the fog-signal was at work. Again the Light House Board was required to look into the matter. Again careful investigation was made. And again it was shown that the fog-signal might be heard far off, and not close to, and the spots where it was not heard were noted and plotted on the chart; and again the steamer people and the light house people were exonerated from blame.

In 1881 I gathered these facts and submitted them to the Philosophical Society. My paper was printed in the Bulletin of the Society, and it was largely copied in maritime and scientific publications in this and other countries. The light house establishments of England, France and Spain reprinted the paper, each in its own language. And the eminent Emile Allard, head of the French light house establishment and a prominent officer of the French Corps of Engineers, plotted my numerical statement of the intensity of sound as heard from the fog-signals, in graphic form, that is, in lines of various width, and sent his diagrams to me in a letter in which he discussed the subject at length.

The Light House Board meantime was considering the matter from a purely practical standpoint. If, it was reasoned, there is a point within earshot of a fog-signal, where, from any cause, the fog-signal cannot be heard, then some other signal should be placed at that point, from which vessels can take a fresh departure. Acting upon that idea, investigation was made as to the region about each prominent fog-signal which it had been said could not be heard at points where it ought to be heard. In several instances I was sent to such points to make investigation and to report with recommendations. In the summer of 1885 I cruised about Point Judith, R. I., and the southeast end of Block Island, both at the entrance of Long Island Sound, and about the light house and fog-signal on Little Brewster Island, entrance to Boston Harbor. An area of silence was found and plotted about one and a quarter miles south of Point Judith, where the

[1] Read before the Philosophical Society of Washington, Nov. 25, 1893.

powerful fog-signal in operation at Point Judith could not be heard. That area was soon marked by a whistling buoy. A similar area was found and plotted five miles from Block Island, and a whistling buoy was placed in the centre of that silent spot.

A curious state of things was found off the light house on Little Brewster Island, Boston Harbor. Complaint had been made as to the action of the fog-signal there, which was a Daboll trumpet, and another and better fog-signal was wanted. Some asked for a siren, some for a steam whistle, and some for a larger and better Daboll. So a battery of fog-signals, one of each kind, was placed there, and I was appointed, with others, on an informal sort of a board to ascertain and report which of the three was best adapted to the place. It was found that the siren gave the best effect, and it was duly established there, and is there yet. But it was also found that there were several areas of silence within normal ear-shot of that fog-signal which were constant as to their general position, but which were floating or variable in their actual positions. There were already so many lights, buoys, spindles, etc., in that vicinity it was recommended that no more be established there lest it cause confusion. It was deemed the most curious concatenation of peculiar phenomena yet met.

In observing all these peculiar phases of non-audition of fog-signals at points where they should be heard, only one vessel had been used at a time. Hence, we had no record as to the sound at more than one place at a time, of a fog-signal. It had been a favorite plan of Professor Henry to use several vessels simultaneously about the same fog-signal, so as to learn where its sound was heard, as well as where it was not heard, at the same moment. The board decided to follow that plan this fall and in this way to re examine, with several vessels at the same time, the sound of the fog signal, which had heretofore been examined with but one vessel at a time.

This duty was devolved on me, and I was ordered to the Clover, a fast-sailing schooner, to carry it into effect. I was permitted to invite two members of this society, Prof. C. A. White, LL. D., Member National Academy of Sciences, and Prof. H. A. Hazen, Forecaster of the Weather Bureau, to go with me on this cruise, and the invitation was afterwards formally repeated by the board. It was planned that when I had reached a scene of operation and a proper day was found, I was to impress any other light house vessel within reach for that day, and the light house district officers were directed to give every practical aid to the expedition. This they did with great readiness and good effect.

Thus it has happened that observations have been made recently from three vessels simultaneously, at three different places, of the sound of a number of fog-signals at which abnormal phenomena had been observed and reported before; and the recent observations have been made, and have been plotted on the same scale as previous observations; so that all the observations made at each place whether in 1881, 1885 or 1893 are now comparable.

The methods used at Little Gull light house and fog-signal station, for instance, were as follows:

The Clover arrived at New London Harbor on the morning of Oct. 19. Leaving her trying to work up to the city, against a headwind, I went ahead in the steam launch. At the light house depot I found the light house steamer, Cactus, with banked fires. In half an hour she was under way, and towing the Clover toward Little Gull light station. Dr. White, Professor Hazen and I went on shore and the light keeper was directed to start up his fog-signal. Dr. White remained on the islet to see that the orders were carried out and to note any variations made from any cause in the usual sound. Then Professor Hazen went on board of the Clover and I returned to the Cactus, and each vessel ran over prescribed courses. Observations of the intensity of the sound were made on each vessel each minute. The direction and force of the wind, the temperature by wet and dry bulb thermometer, and the pressure of the atmosphere, as shown by the barometer, were duly recorded. The appearance of the sea and the sky were also noted.

The next day the Cactus was engaged on other imperative duty and the Clover went out from New London Harbor, where we had spent the night, without her. But Professor Hazen made a rather adventurous cruise in an open steam launch about the fog-signal, with excellent results.

On the third day Professor Hazen was on the schooner Clover, and I was on the steamer Cactus. Dr. White was landed on Great Gull Island, which is small, treeless, and uninhabited, where he had large opportunity, which he fully used, to get the sound of the fog-signal under circumstances not had before. Here Dr. White noted the action and the result of peculiar echoes, and his studies of these echoes have developed an important factor in the discussion.

Off Point Judith we had very light wind, almost no sea, though there was a heavy swell rolling in, and a fair sky; in other words, we had an excellent day for hearing.

The Cactus being again with us, I went on her, Dr. White stayed with the Clover, and Professor Hazen, in spite of the bad character of that vicinity for quick and severe changes of weather, again took to the steam launch; so we got simultaneous observations of the sound of the fog-signal at Point Judith from three vessels, each cruising about on different lines.

In our work about the light on Little Brewster Island, at the entrance to Boston Bay, which occupied two days, we had the help of two other steamers. Major Livermore, of the Corps of Engineers, U. S. A., and Engineer of the First and Second Light House Districts, went with us on his steam propeller, the Myrtle, and Lieutenant Commander Colby, U. S. N., assistant to the Inspector of the Second Light House District, accompanied us on the side-wheel steamer, Geranium. On the first day I was with Major Livermore on the Myrtle, Dr. White was in charge of the work on the Clover, and Professor Hazen went with Lieutenant Commander Colby on the Geranium. On the second day Dr. White went with Major Livermore; I stayed on the Clover, and Professor Hazen remained with Lieutenant Commander Colby on the Geranium. Each vessel ran on different courses on different days, and we got many simultaneous observations from the three vessels. Most of the time was spent on the open ocean between Boston light and Minot's Ledge light, or beyond, or between Boston light and Egg Rock light. Part of each day, as we were going and coming from Boston Harbor, was spent in the Narrows, or in Broad Sound, at the rear of the fog-signal we were observing.

Now, as to our tools. We had on the Clover an annometer at the foremast head, and another at the end of the jib-boom. Both were connected by electric two-conductor cables with self-registering apparatus in the cabin. We also had a barograph which registered the pressure of the atmosphere, and we had a very delicate barometer by which to check the barograph These had been lent to the expedition by the Weather Bureau, and were under the charge of Professor Hazen, who looked after our meteorology. In addition to these, the Professor had brought his own sling pschycometer, an ingenious arrangement of wet and dry bulb thermometers, which he managed with great skill, and clung to with much affection. The Clover had her own complement of thermometers, barometers, etc., in addition to what had come to us from the

Weather Bureau. The balloon which the Secretary of the Treasury had asked the Secretary of Agriculture to permit the Weather Bureau to lend us, and which had been shipped to us, did not arrive. Had it come we might have had Professor Hazen looking down upon us from a great height, and we should have had him at the end of a rope, recording temperature, air currents, moisture, wind and sound from 1,000 feet above, and at intervals of 25 feet, till we landed him on our deck or in the water. Major Livermore, however, used toy balloons, with which to ascertain the force and direction of the upper air currents. The paper balloons were, say, four feet high, and one foot in diameter, at the widest part. They had an ingenious attachment for producing hot air, which, at night, lighted them, and made them for a while clearly visible. The longest flight I saw one of these make was 15½ minutes. Then the Major had spherical rubber balloons of, say, nine inches through, which he filled with hydrogen generated on the Myrtle, which were also quite useful.

The fog-signals we were sent to observe were three steam sirens and a steam whistle. Each signal has its own peculiar characteristic. The second-class siren at Little Gull Island, for instance, gave, during a fog, a blast of five seconds, and then after a silent interval of 40 seconds, and another blast of five seconds, and it continued this alternation of blast and interval while the fog continued. This blast and interval served to differentiate this signal from other signals within ear-shot, and especially that at New London light-house, which was a six seconds blast, alternating with a silent interval of thirty seconds.

The siren is the most powerful fog-signal in existence. The English Government adopted it after a favorable report on it made by a commission sent to this country headed by Sir Frederick Arrow, and also after a report by Professor Tyndall, who then bore the same relation to the English lighthouse establishment that Professor Henry did to the United States lighthouse establishment, that is, of scientific adviser.

Tyndall says of the siren in his book on "Sound," third edition, p. 316: "The steam siren is the most powerful fog-signal which has been tried in England." Again Tyndall says on p. 318: "We find the sound range on clear calm days varying from 2 1/2 to 16 1/2 miles." Again he says on page 319: "It may be relied upon at a distance of two miles; in a great majority of cases it may be relied upon at a distance of three miles, and in a majority of cases at a distance greater than three miles."

Now as to the full range of the instrument, Tyndall says on page 321 of the same book: "The most conflicting results were at first obtained. On the 19th of May, 1873, the sound range was 3 1/3 miles; on the 20th it was 5 1/2 miles; on the 2nd of June, 6 miles; on the 3rd, more than 9 miles; on the 10th, 9 miles; on the 25th, 6 miles; on the 26th, 9¼ miles; on the 1st of July, 12¾ miles; on the 2nd, 4 miles; while on the 3rd, with a clear, calm atmosphere and smooth sea, it was less than 3 miles."

I have quoted this much from Tyndall, for while he accepts the siren, he damns it with faint praise, and what he says is about the worst that has been said of it. The French, who also adopted it, speak in much higher terms of it, and the Light House Board, while constantly searching, has found nothing better. It remains the best fog-signal in the world, and it may be regarded as a constant memorial of the work of Professor Henry, who, for light-house purposes, was its inventor.

But good as the siren is, it leaves much to be desired. It is a great big clumsy, ugly machine, expensive to make, expensive to run, and expensive to keep in repair. It is maintained to make a great big ugly noise continuously, and of a certain kind and at certain intervals. It makes the noise, without regard to ethics or esthetics; but it might keep its pitch better; and it might maintain its intervals better. It is not an instrument of precision. It has its limitations. They are not entirely unconnected with the pressure of its steam; in other words, with its management. But it approximates exactness sufficiently near to answer the purposes for which it is intended. When the mariner hears it, and hears it aright, he knows where he is. The question we are discussing is not so much connected with the sound made as with the sound heard. It is not the aberration of the sound, but the aberration of the audition of the sound with which we are concerned.

Now as to the method used to determine the intensity of the sounds of the fog-signal we tested. This we did, on this cruise, by ear, and on the same scale and in the same way in which it was done in observations made in 1881 and 1885.

Each of the party on the Clover used the scale of 10. It was understood that 10 was the sound of the highest intensity, and 0+ the lowest sound observable. We divided the scale, however, thus: 1 1 plus, 1½, 2 minus, and then 2. Mr. Wallace, Major Livermore's assistant, used the scale of 100. I have no doubt that is just as good as my scale, but as I had commenced my observations on the scale of 10, I carried that scale through these observations in order that those made in '93 might be comparable with those made in '85 and in '81. The question of personal equation has arisen, but I have carefully avoided any comparison of the mode of hearing, or rather accuracy of hearing, between members of my party. My direction to each was to record 10 as the highest sound of the fog-signal that could be heard on board of the vessel in which he was making observations. When they were as near as they could get the vessel to the source of sound, the distance was, as a rule, not more than one-fourth of a mile. The minimum sound was 0. plus. One-half of the sound between 0+ and 10, I considered as 5, and half-way between that and maximum was called 7½, and half-way between 5 and 0+ was regarded as 2½, and then we divided still finer between those points. In that way I think we got a practical solution of the question, and are as nearly accurate as it is practicable for observers to be, that is, for practical, but not for scientific, purposes.

Each person preserves his own scale throughout, recording the maximum and minimum and medium, and dividing between those points according to the accuracy of his own ear. I noticed that different members of my party, and of Major Livermore's party, did not mark instances the same under some circumstances; but the differences were slight, and they could be accounted for by interfering noises in different parts of the ship, which affected different hearers in those parts of the ship, so that their hearing of the same noise was to a certain extent interfered with. I think the results reached were of a practical character, although they were not such as might be considered severely, or even scientifically, accurate. They were not such as would have been recorded by a self-registering machine, that is, they were not as finely phrased. I tried to put myself in the place of the mariner, who might hear a fog-signal without knowing what it was, and who might be forced to determine its identity by the character of its blast, the intensity of its blast, and the continuation of the silent interval between blasts.

Major Livermore has a large number of observations which have been plotted, and I think will be comparable with ours when ours are plotted.

We are now having very delicate instruments made with which to measure the character and the intensity of the sounds made by fog-signals; and thus I hope that

next year we may be able to give the intensity of the sounds heard, with an approach to absolute accuracy.

The results thus far obtained, however, are such as a captain of a vessel coming onto our coast in a fog and a gale would be apt to get. It is for him the fog-signals are established, and I have tried to put myself in his place and to hear with his tired and strained ears the sounds which must be distinguished and differentiated from the shrieking of the wind, the creaking of the cordage, the rattle of the machinery and the roar of the surf.

If he has heard aright the sound of the fog-signal and can tell from the length of its blast and the following interval of silence which one of the several fog-signals in that vicinity it is, he is certain of his position.

The experiments thus far made and the observations taken are to make sure that the mariner can hear aright what he does hear, and to provide against his acting upon errors in hearing, which, if acted on, may place his ship in peril.

SASSAFRAS TREES.

BY WALTER J. QUICK, COLUMBIA, MO.

As being of some scientific interest, it is worthy our attention to note the marvelous growth that ten trees of the above well-known variety have acquired here in Missouri—a growth that is so exceptional of this species that it has not been observed elsewhere in the United States.

The *Sassafras officinale*, of the order *Lauraceæ*, the Laurel family, is very seldom known as little more than a shrub or bush and generally as growing poorly or not at all on fertile soil. In truth, it is looked upon as being in its native element in company with and growing on thin land. This is not a fact, but the opinion prevails since old and worn-out fields, depleted of their fertility in greater part, when abandoned, grow up to "brush," not the least profuse of which is the sassafras. It is a native of America and has been found in every State in the Union, growing much more abundant on poverty-stricken soil, but more luxuriant and larger in proportion, we conclude, as the per cent of humus in the soil increases. In the poor, white clay lands of the New England States and some parts of Indiana, Kansas and this State we have observed it growing where it seems to sprout profusely and does not reach a height of over twelve feet, usually six or eight feet, while in the same States on richer land it will not be found in thick profusion, but scattered and attaining almost to the dignity of a tree in size.

Recently it was our pleasure to visit the beautiful farm of Mr. T. B. Hickman, near Columbia, Mo. During our stay we were shown the various interests of the owner, and our attention was summoned to some peculiar trees of the sassafras variety. Their difference from others of this species consists in their vigorous growth and extreme size, being the largest any one present had ever seen or of which we had in any way known. This preternatural development inspired us to investigation. They exhibited on measurement the surprising circumference of 80 to 82 inches—a diameter of over 26 inches. As the bark is thick and rough, similar to walnut, the diameter of the solid wood is not likely this much, but fully two feet. By triangulation we ascertained the height to be about fifty-five feet, and the whole ten will not vary much from these measurements.

While there is very little indication of decay, as a matter of fact, these trees are fully grown for this variety. Their location is very auspicious for the growth they have made, being the low, rich and moist soil of Bonne Famme creek bottom. The writer has never seen larger trees, and is unable to learn of larger specimens on this continent, with the exception of the species of sassafras of California and the western slope of the Rocky Mountains, known as *Oreodaphne Californica*, which attains a still larger size "in the land of big trees." The aroma from the leaves of this variety is more pungent, in fact, so much so as to occasion excessive sneezing, frequently during high winds. It has a greater reputation medicinally than ours, though the importance of the latter is by no means small.

Our *officinale* species has been introduced into England as *Sassafras laurus*. As is usual with anything imported, they appreciate it more as medicine than we do. A tree near the Royal Gardens at Kew has attained a height of about fifty feet, and is said to be over 110 years old. As there are no other figures given, we cannot compare the size with that of the Hickman trees, but the height is not so great.

Almost every country has one or more species of this tree, all said to differ in some characteristic from ours, but all having the same odor and similar aromatic, sweetish taste. But one country has larger trees. Those of New Zealand grow to a height of 100 to 150 feet. This tree appears in every clime, and is described as having "a large head of horizontal branches." The fruit is a small, black drupe, which is not palatable, but is eaten by birds. The sassafras oil of commerce is made from these seeds and the buds. The leaves of our species are very dark green, rather thick, broad, oblong and elliptical.

In Italy it is more like the American species than any other, and is known as *Sassafrasso*. The word comes from the Latin, *saxum*, a stone, and *frango*, I brake, so named because it was believed that the use of the tea made from it would desolve the gall stones of the bladder and prevent their formation.

In the southern states sassafras grows to the size of trees, generally small, but very abundant. The air is said to be more pregnant with its aroma than further north, and it can be detected a great distance at sea. The bark seems to be more fragrant, too, when steeped.

Sassafras tea is very popular in many sections of the countries where the tree grows. The bark of the roots is kept everywhere for sale, for that purpose. In addition to its use as a table beverage it is employed as a tonic and constitutional stimulant. In those localities where the sugar-maple tree is a native and abundant a very delightful drink is made from the "sugar-water," or sap and bark of the sassafras root. It makes the finest tea in the spring when the sap is forming and is then drunk mostly to resuscitate the system, improving the appetite and aiding the digestion. It is also valuable for boils, pimples and eruptions of all sorts, as well as for rheumatism.

The pith of the new growth and sprouts contains a gum or mucilage, used in eye medicines, as being important in reducing inflammation and granulations. This product is also prepared in the form of a drink for diseases of the kidneys, catarrhal troubles and dysentery.

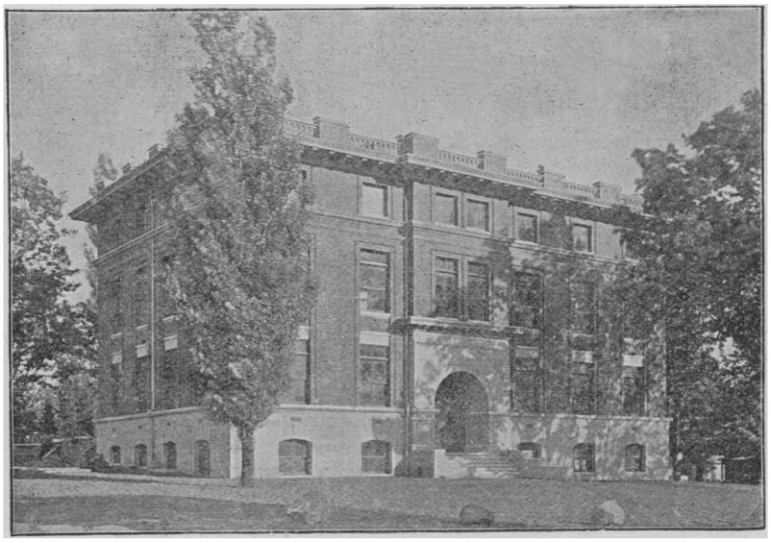
In many localities there is perhaps no more popular farmers' remedy for diseases of horses. It is administered by grinding the root bark to a powder and giving it in the feed, or by preparing a decoction with which the feed is mixed. Frequently the roots are placed in the horse's feed trough, and he is permitted to bark them himself, which he willingly does, apparently with much relish. In the spring it greatly improves his appetite, strengthens him and assists in shedding and sleeking his coat.

THE McMILLAN CHEMICAL LABORATORY.

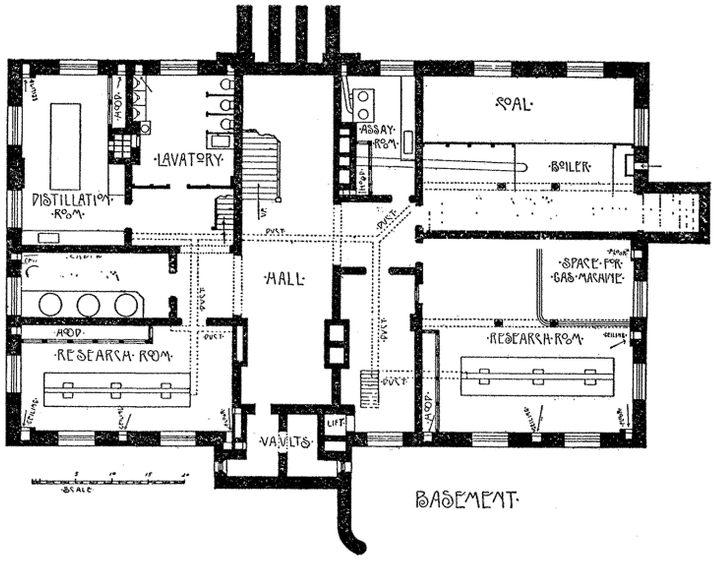
BY DELOS FALL, ALBION, MICH.

THIS building, the generous gift of Senator James McMillan, is now completed and will be devoted exclusively to the Department of Chemistry. It was dedicated Nov. 15 with appropriate exercises, addresses being delivered by Professor A. B. Prescott, of Michigan University, Professor H. H. Donaldson, of Chicago University, Senator McMillan, Professor Washington Gardner and others.

The plans were drawn by Mr. E. W. Arnold, architect, of Detroit; the building was erected by the firm of Wallace & Morris, builders and contractors, of Detroit.



The cut of the exterior and the floor plans here presented will give the reader a general idea of the structure. The general form of a building that would best suit the requirements of the various departments was found to be a rectangle, 52×88 feet. This is divided into two parts in each story by a hall 13 feet in width. This provides a wide, recessed entrance on both sides of the building.



There are three stories and a basement, all abundantly lighted by high and broad windows.

All outside and inside walls are of brick. The entrances, sills, lintels, copings, etc., are cut stone, the cornices of galvanized iron. The foundations are of stone. From the ground to the first story window-sill, the outside is faced with cut stone ashlar in courses.

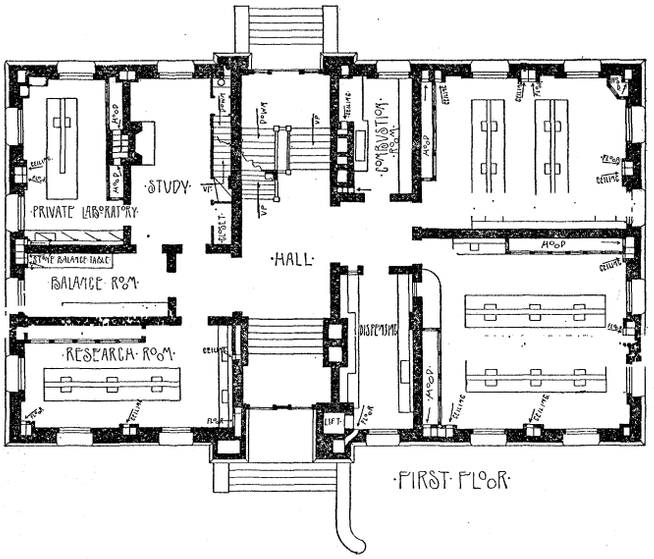
The exterior treatment is colonial in character, which will give to the building a quiet dignity and, at the same time, perfect appropriateness to the purposes for which it is erected.

The basement story is 10 feet high and contains a boiler and fuel room, an assay laboratory with three furnaces and a fire table; a hall, a fire-proof storage vault; a research room, fitted with tables, ventilating hoods, etc.; a room for large gas tanks holding oxygen and hydrogen; a distilling room, with fire-proof tables, hoods, etc.; a lavatory, a storage room, and a second large research room.

In the first story, which is 13 feet high, there is, on one side of the hall, the organic laboratory, 27×30 feet, containing tables for 24 students, with 29 feet of hoods, also wall tables, cases for chemicals, etc. Adjacent to this is the quantitative laboratory, 22×30 feet, with tables for 20 students, hoods, wall tables, etc.; a combustion room, 10×17 feet, and dispensing room, 10×21 feet.

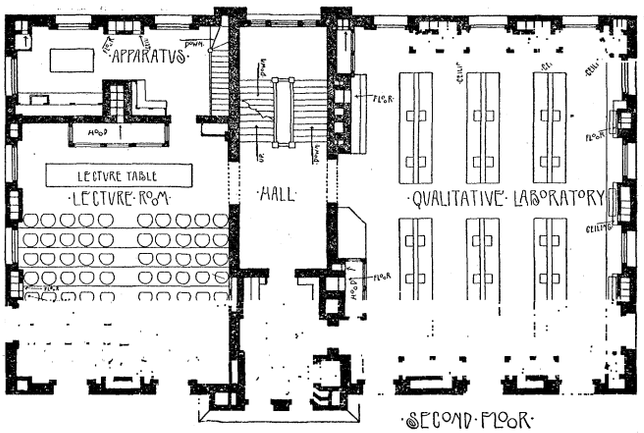
On the other side of the hall is the instructor's study with a private stairway to the basement and the lecture room above. This is furnished with book cases, fire place,

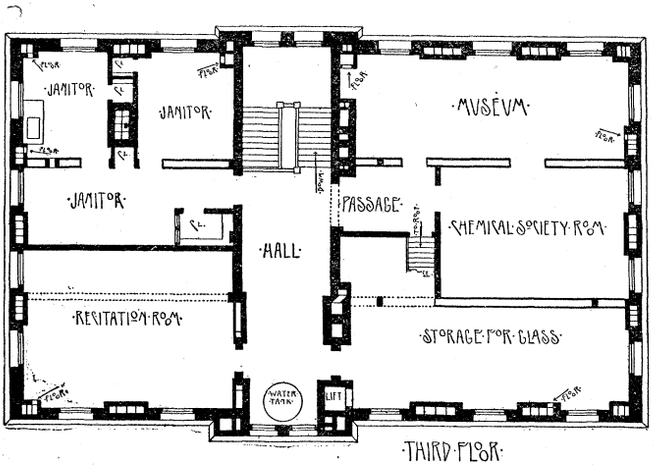
wardrobe, etc. Off this is a private laboratory, with large table, hoods, wall tables, cases, etc. The balance room, 9×21 feet, and a research room, 15×30 feet, complete the equipment of this floor.



The second story is also 13 feet high and contains the qualitative laboratory, 40×49 feet, with tables for 80 students, with 7 hoods, wall tables, cases, etc. The lecture room, also on this floor, 30×37 feet, will accommodate 82 students, the seating being arranged in rising tiers of chairs. This room also contains an elaborately furnished lecture table, provided with a large pneumatic cistern, a powerful down draught for handling noxious gases, wash bowl, gas, water and waste pipes at convenient intervals, hydrogen and oxygen from the tanks below, electric connections with dispensing and assistant's rooms, a plunge battery, etc.

Behind the lecture table is a hood 14 feet long, double counter-balanced blackboards, a rolling stereopticon curtain, etc. Off the lecture room is an apparatus and preparation room, which will also contain cases for lecture table apparatus.





The third story is 10 feet high and contains a chemical museum, a class room, a chemical society room, three rooms for janitor's residence, store rooms, etc.

The heating is by steam, direct radiation, and in addition to this there are encased radiators recessed under the windows with register openings through the wall. By this means a supply of warm, fresh air is admitted to each room, which can be fully controlled.

The ventilation is by large ventilating flues and groups of flues arranged so as to ventilate all parts of the building and at points where most needed. The flues are in three sets, viz.: for floor ventilation, for ceiling ventilation and for hood ventilation, each set independent of the other and yet each working in combination with the other, and all controlled independently. Steam heat is applied in all flues in the upper story, which will insure their proper working.

The Laboratory is supplied with gasoline gas from a machine of 400 Bunsen burner capacity. Each student's table is provided with two gas and two water cocks, wash bowl, two drawers, cupboards and shelves. The gas and water are also distributed to all hoods, dispensing rooms, etc.

THE GRADUAL DISAPPEARANCE OF THE RANGE GRASSES OF THE WEST.

BY I. W. TOURNEY, TUCSON, ARIZ.

In the early days of our great West almost the only method of travel from the Mississippi Valley to our western coast and intervening points was by caravan. Wagons drawn by horses or cattle were several months in making this journey. During this time the stock subsisted entirely upon the natural forage afforded by the country traversed. For the most part, this forage was perennial grasses, which at that time were everywhere abundant. Then the whole of the West was a great pasture, unstocked, save for the herds of buffalo, deer and antelope. Many regions which were covered with a luxuriant growth of nutritious grasses are now entirely destitute of vegetation, if we exclude a few straggling, stunted bushes and the yearly crop of annuals which follow the summer rains. As a more specific case, the rancher who drove the first herd of cattle into Tonto Basin, in central Arizona, found a well-watered valley, everywhere covered with grass reaching to his horse's belly. In passing through this region a year ago scarcely a culm of grass was to be seen from one end of the valley to the other. This transformation has taken place in a half-score of years.

The important native forage grasses are perennials, many of them of the great western genus *Bouteloua*. Their growth in all parts of arid and semi-arid regions is slow. The grasses which formerly covered so great an area of our West were years in developing their root systems, and, in not a few species, even the culms were of several years' growth. When only cropped by the deer and buffalo they were able to hold their own against the drought and other agencies of nature. By stocking this great western country with the herds of civilization, these grasses were mowed down before them like timber before the forest fire. They are gradually becoming less and less, and it is only a question of a few years when, in many regions, they will disappear as a material factor in the natural forage of the country. Regions long distances from water, out of reach of the great herds of cattle everywhere on the un-fenced domain of each western state and territory, are yet well-covered with perennial grasses. Last year in passing over a large unwatered area north of Prescott miles of country were found covered with grass, while in much more favored localities in the vicinity of water these species have entirely disappeared.

Cattle men are putting down wells in many of the unwatered regions and moving their herds thither. The first year the forage is excellent, the next year it is not so good, and the third or fourth year it becomes so poor that the well is abandoned and another sunk in an as yet unfed locality. The more arid the region the more disastrous is the effect of overstocking. When stock are driven into a locality they are allowed to increase, not in proportion to the amount of forage that the given range is in condition to furnish year after year, but as many are grazed as can find feed for the time being. No consideration or thought is expended on the future. This condition of things has been most disastrous to stock-men throughout the West. To within a few years the efforts of cattle-men were expended in increasing the size of their herds, and this continued until nearly every vestige of the perennial grasses was swept away. Since that time cattle have died by thousands, the assigned cause in most cases being cold weather or drought, when in reality it has been the lack of forage; the direct result of stocking the range to a greater extent than the natural conditions year after year will justify.

Many are deceiving themselves in thinking that a few rainy seasons will bring back the rich perennial grasses of the years gone by. It seems to me, under the present condition, the time can never come when our western range will be as rich in forage as it was ten or more years ago. Under the most favorable conditions, with cattle entirely excluded, it would take many years for these grasses to get the foothold that they formerly held.

The annual grasses, mostly the smaller *Bouteloues* and *Aristidas*, are not so disastrously affected by overstocking. They seem to be always on hand to cover the plains with verdure after the rainy seasons. They furnish excellent forage during the short period that they are at their prime, but at the most they can only provide feed for three or four months of the year. The ranchman makes a marked distinction between the annual and perennial grasses. He aptly designates the annual as "seed grasses" and the perennial as "root grasses." The seed grasses soon become worthless, their bleached, short culms are broken and beaten into the sand by storm and wind. The root grasses retain their vitality and remain green for the greater portion of the year. Even when dry, their harder, stronger and larger culms contain as much nutrition as well-cured hay, and are, or rather used to be, the valuable winter forage of the West.

In conclusion, there is a limit beyond which no range can be profitably stocked. If we exceed this limit it will not only be detrimental to the permanency of the range, but in the end will be disastrous to the stock as well. It is but natural that a growth of top is necessary to a growth of root, therefore if the tops be continually cropped to the ground, the roots will finally perish. This is especially true of grasses of arid regions, growing in bunches or scattered about here and there a few culms in a place. The range is frequently fed so close that few of the better grasses mature seeds, while many others are tramped out by horses and cattle. During the past few years the effect of over-stocking has shown itself in the inferiority of the cattle when compared with those of former years. They are poorer as a consequence of their increased number and the resulting deterioration of the range.

—The essays received by the Canadian Institute in the competition for a prize for the best act "which, if made law, would give the whole Canadian people equal representation in Parliament," have been issued to the final tribunal of judges. Their reports are returnable on March 15 next; immediately thereafter the awards will be announced.

MEETING OF THE IOWA ACADEMY OF SCIENCES.

THE eighth annual session of the Iowa Academy of Sciences occurred in Des Moines, Iowa, Dec. 26 and 27, 1893, and was one of the most largely attended and profitable in the history of the Academy. About thirty Fellows were in attendance, and over forty papers were presented.

The officers elected for the coming year were: Dr. L. W. Andrews, President; Prof. H. W. Norris and Dr. C. R. Keyes, Vice-Presidents; Herbert Osborn, Secretary-Treasurer; and Professors Arey, Hendrixson and Nutting additional members of the executive committee. Dr. L. W. Andrews presented a paper on the "Assumption of a Special Nacent State," in which he concluded that the assumption of such a condition is the survival of an obsolete doctrine and that it explains nothing which cannot be as well explained without it. In another paper he treated of some peculiarities of Ferric Sulphocyanate, discussing them from a physico-chemical basis.

Prof. A. A. Bennett made a verbal report upon certain work done in the Chemical Laboratory of the Iowa Agricultural College and called attention to the methods in vogue in instruction in chemistry.

Prof. W. S. Hendrixson, of Grinnell, Iowa, discussed "The Electrolysis of Silver," detailing a method by which pure silver could be obtained in a rapid and easy way, and, in another paper entitled "Some Laboratory Apparatus," he described several inexpensive forms, one of which was for the distillation of water.

Prof. G. W. Bissell presented some notes on experimental engineering at the Iowa Agricultural College, giving the results of some studies, the result of which can be used to advantage in the designing of certain kinds of machinery.

Prof. S. Calvin, of Iowa City, discussed the "Geological Position of Benettites Dacotensis, MacBride," with observations on the stratigrophy of the region in which the species was discovered. This was a careful description of the geological features of the region of Hot Springs, South Dakota, with the conclusion that this fossil belongs to the Cretaceous.

Dr. C. R. Keyes read a paper upon the "Derivation of the Unione Fauna of the Northwest." He compared the faunæ of different river basins and discussed at length their relations and derivations. In discussing the paper Professor Shimek, of Iowa City, called attention to the similarity of the Unione Fauna of eastern Nebraska and eastern Iowa, whereas in central and western Iowa these forms are much less plentiful.

Prof. J. L. Tilton, of Indianola, discussed the "Origin of the Present Drainage System of Warren County." The present river valleys aud larger ravines fit into the pre-glacial valleys, while in the smaller divisions only do we find erosion without regard to the pre-glacial configuration of the country.

H. F. Bain, of the Geological Survey, in a paper on "The Structure of the Mystic Coal Basin," presented data from a number of different sections, showing a remarkable persistence of character in the coal strata at different points, which has had a very important bearing upon the development of the coal industry of southern Iowa. In another paper he gave a careful record of the strata penetrated in the boring of the "Deep Well at Sigourney." These borings of nearly two thousand feet penetrated the various formations to the "St. Peters" and entered the Oneota.

E. H. Lonsdale, of the Geological Survey, in a paper entitled "Southern Extension of the Cretaceous in Iowa," presented the results of an extended examination of the southwestern portion of the State, in which he has been able to determine the occurrence of Cretaceous deposits at points considerably farther south than hitherto recognized.

A. G. Leonard, on the "Zinc Deposits of Northeastern Iowa," showed that these deposits have proven quite valuable and are being extensively worked, occupying the same localities as the lead deposits, which at one time were worked with profit, but have for a number of years been practically abandoned. He also spoke of "Satin Spar from Dubuque, Iowa," and exhibited some very handsome specimens of this mineral.

H. A. Jones, of Grinnell, Iowa, in a paper on the "Coal Measures in Powesheik County," indicated the location of coal seams and coal measure strata in the vicinity of Grinnell and at other points in the same county.

Prof. T. H. McBride, of Iowa City, presented some very interesting "Notes on North America Cycads," in which he described the occurrence of a remarkable new species of Benetites found in South Dakota. He also showed photographs of a large specimen of the fossil and a specimen of one of the living species for comparison. In another paper he discussed the "Distribution of *Rhus typhina*."

The presidential address by Prof. L H. Pammell was devoted to a discussion of bacteria, their relation to modern medicine, the arts and industries. It was a very comprehensive and interesting account of the historical development of bacteriology and of the relations which these organisms bear to modern medicine and to various important industries. He also presented the following papers: "The Powdery Mildew of the Apple," "Further Notes on *Cladosporium carpophilum*" and "Notes from the Botanical Laboratory of the Iowa Agricultural College."

Prof. H. W. Norris, of Grinnell, in a paper on the "Development of the Ear of Necturus," presented the results of a very careful study of this organ and exhibited drawings of sections and also, for comparison, reconstructions of the ear of *Amblystoma*.

Prof. B. Shimek, of Iowa City, in "An Additional List of Iowa Molusca," recorded a considerable number of species additional to the list which he published some years ago. He also presented a paper and exhibited specimens illustrating the variations in certain Succinidæ occurring in the *loess*, comparing them with living forms and showing conclusively the great range of variation in certain species. He considers these shells an important factor in determining the age of the *loess* formations.

Prof. C. C. Nutting, of Iowa City, gave two anatomical papers, one devoted to the "Vascular Supply of the Teeth of the Domestic Cat," in which he showed that the distribution of the blood vessels to the teeth was different from what has been commonly held; the other discussed the "Homology of the Inca Bone."

Mr. Herbert Osborn, of Ames, presented a paper upon the "Distribution of Hemiptera," giving records which extend the known distribution of a number of species, also a paper including laboratory notes, in which he called attention to species particularly useful for laboratory work in this region.

Mr. C. W. Mally, in the "Hackberry Psyllidæ of Iowa," reviewed the species occurring in the state and gave very full descriptions of certain forms which had been studied in detail in their different stages.

Mr. F. A. Sirrine described "A New Species of Plant Louse Occurring on Thorn."

Aside from these papers, which were read, a number of others were read by title and will appear in the proceedings of the Academy, which will be published by the State at an early date.

Resolutions were passed commending the Geological Survey and, also, looking toward the securing of a greater amount of scientific literature in the State Library.

BALTIMORE MEETING OF THE AMERICAN CHEMICAL SOCIETY.

BY CHARLES PLATT.

After a rather dark period in its history, the American Chemical Society has now attained a firm footing, and has become what it has ever aimed to be, a truly national representation of American chemists. The summer meeting in Chicago and the recent Baltimore meeting have been extraordinarily successful, not only in papers presented, which are, after all, very secondary attractions, but more particularly in the establishment of those feelings of good fellowship and esteem which can only be born of personal acquaintance. During the last meeting this sentiment was expressed many times, and there was a universal feeling of congratulation and good-will, which made the meeting extremely satisfactory. The general verdict seemed to be that the time allotted was too short, and that a programme extending over three or four days, instead of the two provided by custom, would have been more suitable. The meeting convened Dec. 27, 1893, in the lecture-room of the chemical department of Johns Hopkins University, with President H. W. Wiley in the chair. President D. C. Gilman welcomed the society to the University, and Prof. Ira Remsen performed the same office in behalf of the chemical department. In response, President Wiley returned thanks for the society for the welcome so kindly extended, and, continuing, spoke of the remarkable growth of the society during the past year, its field in America, and the increasing need of such a bond of union as is provided. Professor Wiley then opened the business of the meeting with his presidential address on "The Relations of Agricultural Chemistry to the Waste and Recovery of Plant Food." Other papers on the programme, read in person or by title, were as follows: "The Widespread Occurrence of Barium and Strontium in Silicate Rocks," W. F. Hillebrand; "The Estimate of Small Amounts of Barium and Strontium in Silicate Analysis," W. F. Hillebrand; "A Plea for Greater Completeness in Chemical Rock Analysis," W. F. Hillebrand; "A Study of the Distribution of the Oleoresins in the 'Pinus Palustris,'" Omar Carr; "Salicylic Acid in Food," K. P. McElroy; "Utilization or Garbage," Bruno Terne; "Report on the Determination of Atomic Weights Published during 1893," F. W. Clarke; "The Detection of Strychnine in an Exhumed Human Body," W. D. Noyes; "The Importance of the Study of Biochemistry," E. A. de Schweinitz; "Upon Uniformity in Sampling and Assaying Copper Bullion," G. W. Lehmann; "The Preservation and Arrangement of Chemical Abstracts," Thomas M. Chatard; "Notes on the Electro-Metallurgy of Zinc," Charles Platt; "The Phenyl-hydrazen Test for Glucose in Urine," C. E. Pellew; "Expert Testimony," W. P. Mason; "A Description of the Boric Acid Springs in Tuscany," W. P. Mason; "Phosphorus in Steel," C. B. Dudley; "Determination of Phosphorus by the Molybdate Method in the Presence of Arsenic in Iron, Steel and Ores," J. O. Handy; "The Analysis of Malt," J. A. Miller.

Other papers not on the programme were presented, among them one by Dr. Thomas Taylor, of Washington, and another by Prof. G. F. Baker, of Philadelphia, who read a memorial to the late T. Sterry Hunt.

In the afternoon the society accepted the invitation of the Baltimore Copper Smelting and Rolling Company, and several profitable hours were spent examining the details of refining at these representative works. A complimentary banquet was enjoyed at the Eutaw House in the evening. On the second day the reading of the papers was continued and the annual business of the society transacted. The officers elected for the ensuing year are: President, H. W. Wiley; General Secretary, Albert C. Hale; Treasurer, C. F. McKenna (resigned); Librarian, F. E. Dodge; Directors—C. F. Chandler, P. T. Austen, C. A. Doremus, H. C. Bolton; Council—C. B. Dudley, C. E. Munroe, Wm. McMurtrie, J. H. Appleton. The meeting was brought to a close with a delightful excursion down the river to Sparrows Point, where the works of the Maryland Steel Company were thoroughly inspected.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as a proof of good faith.

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Do Earth Worms Rain Down?

The old-time notion that earth worms, frogs, fish, etc., "rain down" is now seldom mentioned by intelligent people except in the way of ridicule. The sudden appearance of these animals after a shower is, however, a matter of common observation, and I am not aware that any adequate explanation of the phenomenon has ever been given.

I have heretofore mentioned the finding of minnows after a heavy rain in pools and ditches which were dry not long before. As for earth worms, their nature and habits seem to preclude their coming to the surface voluntarily. When dug up and left on top of the ground they seem very uncomfortable and lose no time in burying themselves again, as soon as they can find a spot where the earth is soft enough to penetrate. Of those found after a rain, some are dead, others nearly so, and those which are in motion seem plainly to be seeking a place to burrow. While it would seem to be impossible that they should have come down from above, it is very remarkable that they should come up from below, leaving their dark, earthy home to be pelted by the rain, which seems so disastrous to them. Besides, they are often found in situations which they could not have reached from the earth, as in tightly cemented cisterns, closed with no opening except where the water pipe enters from the roof. Have those found drowned in rain barrels committed suicide by crawling up the side of the barrel and thence into the water? By the way, who can vouch for their ability to climb a vertical surface in that way?

This morning, after a shower, I found several earth worms near the middle of a street paved with asphalt. There was no crack or crevice in the pavement, and it connected smoothly, on each side, with a curbstone six-and-a-half inches high. It would seem entirely contrary to nature for them to leave the soft earth, climb over the curbstone and make the long journey to the middle of the street.

I have no theory or explanation to offer. My relation to the subject is merely that of an interested observer. I would be glad if others would contribute their observations, with a view to arriving at the true explanation.

Charles B. Palmer.

Columbus, Ohio.

Late-Blooming Trees.

Dr. Walter Mendelson inquires in *Science* for Dec. 15, 1893, as to "cause and effects of late-blooming of fruit trees." The fruit buds of pears, peaches, apples and cherries are formed during the late summer and early autumn. If there should be warm, damp weather in the autumn, premature blossoming is frequently caused, and the result is the fruit crop of the following

season is diminished in proportion, as, of course, no new buds can be formed.

This late blooming is not at all uncommon, although I do not remember having noticed any as early as September. One season in the first week of November the pear trees in the garden were quite white with blossoms, but unfortunately I cannot recall the year.

Dr. Mendelson may enjoy a very pretty bouquet in February or March by placing in water in a sunny window the fruit-bearing branches of pears, apples or cherries; in a short time they will develop their beautiful and fragrant blossoms. F. J. THOMPSON.

New Brighton, Staten Island.

A CORRECTION.

Science is so generally exact in following copy that I must have left out one important word in a recent communication. I should have said that the *early* Iroquois had no council wampum. When the Dutch came they obtained it fast enough, but it is found on no earlier sites in their territory. The later ones have furnished it in abundance.

I wish to record the occurrence of the thick-billed guillemot in this part of New York. A young one was shot on the Seneca River, at Baldwinsville, Dec. 15, 1893. It has not been reported so far inland before. Two species of cormorant have been shot on Onondaga Lake, and I heard that a pelican was recently killed there, but have not seen it. W. M. BEAUCHAMP.

Baldwinsville, N. Y., Dec. 28, 1893.

LATE-BLOOMING TREES.

TREES or shrubs if stripped of their foliage during the summer will put out new buds and new leaves and blossoms. It is a common saying with farmers that when a tree blossoms in the fall it is about to die, which is generally the case, as it mostly occurs on diseased trees. On such a tree the leaves will often turn yellow and fall off during a dry summer. The later rains will put a little new life into it, and it will often put forth buds and blossom. The same occurs if healthy trees are stripped of their foliage during the summer.

The phenomenon of "the late blossoming of trees," referred to by Dr. Walter Mendelson in *Science* of Dec. 15, 1893, was observed here. During the latter part of September and the first of October great numbers of fruit trees were in bloom, and on many green fruit set and grew; but they all occurred in the track of a severe hail storm which in August passed over a strip of country about half-a-mile in width, cutting the foliage completely from the trees. Possibly Brielle and Alpine, N. J., were in the track of that hail storm.

THOMAS S. STEVENS.

Trenton, N. J., Dec. 28, 1893.

AS TO FEIGNED DEATH IN SNAKES.

WHILE on a trip to the Bad Lands in northwest Nebraska and South Dakota in the summer of 1892, collections of rattlesnakes were made. Being much interested in the recent articles on "Feigned Death in Snakes," I have the following statement to make: Whenever a freshly captured rattlesnake was introduced in the box with the former captures it usually vented its rage on them by striking and biting. No ill effects whatever ensued. Also, when teased, the snakes would bite one another. We lost no rattlesnakes whatever on the trip. We often teased the snakes before capture, and in not one instance did they show any tendency to feign death. H. H. EVERETT.

Lincoln, Neb., Dec. 27, 1893.

THE LEAST BITTERN.

LAST summer a wounded bittern, the smallest of them all, *Botaurus exilis*, came into the grounds of the New York State Fishery Commission, at this place, and as its wing was hanging down one of my men caught it and amputated the wing. It remained and fished in a swampy bit of land where the minnows are plenty, in a pool fed by tide water, and promises to winter there. Its habit of remaining motionless when I approach it slowly and in plain sight is interesting, perched on a stick, or standing in the mud with its neck drawn up close and bill pointed upward. I can go within two

feet of it and walk all around it, and the bird will not betray a sign of life, even by winking. This I do several times a week, but, if I come on it suddenly, over the bank, it will utter a cry and flop into the water and wade or swim off. I am getting fond of seeing it simulate an inanimate thing.

FRED MATHER.

Cold Spring Harbor, N. Y.

BOOK-REVIEWS.

Handbook of Public Health and Demography. By EDWARD F. WILLOUGHBY, M.D., Lond. London and New York, Macmillan & Co. 509 p., 1893. $1.50.

THOUGH appearing for the first time under the present title, this is, in fact, a third edition, greatly enlarged and improved, of the "Principles of Hygiene," published in London, 1884 and 1888. To this latest edition several important chapters have been added, as, for instance, those on "Vital Statistics," "Sewage Disposal," "Unhealthy Trades," and "Sanitary Law," while some other matter entirely irrelevant to the subject in hand has been omitted. The author, as stated in his preface, has endeavored throughout so to combine scientific accuracy with the popular treatment of personal health and social problems as to render the work a clear and comprehensive manual of the principles and practice of public health, equally adapted to the purposes of the medical man, the student, the teacher and the general reader. Hygiene is treated under the general heads of "Health of the Man," "Health of the House," "Health of the City" and "Health of the People," with sub-divisions into sections on "Dietetics," "Clothing," "Exercise," "Air, Warmth and Light," "General Sanitary Arrangements," "Water Supply," "School Hygiene," "Preventable Diseases," etc. The remaining chapters include an admirable treatise on "Demography," in which many common errors, statistical and otherwise, are exposed; a chapter on "Meteorology," another on "Sanitary Law," and an appendix of tables, etc. These various subjects are discussed so thoroughly and are so comprehensive that we are provided with a most excellent book of reference in all matters pertaining to hygiene.

Particularly noteworthy are the sections on "Dietetics" and those dealing with "House Drainage and Sanitation," and also that which discusses the neglected question of "School Hygiene." We say neglected, for even in the face of modern enlightenment on these subjects many, if not most, of our school buildings continue on the same general lines of the last generation, remodelled only so far as to gain a greater seating capacity. We do not refer to the "sanitary arrangements" of the plumber; the school building is always a favorite place for costly experiments in that direction, but rather to the heating, ventilating, school desks and seats, etc. One defect which is probably the last thought of in school building, and yet the surest in its evil effects, is that of school lighting, and in treating this all-important section the author has given us the benefit of such authorities as Professors Cohn and Förster, of Breslau, the eminent oculists. How important this subject is at once comes home to one when we remember the alarming increase of weak eyes among school children, the headaches, and the so often repeated complaint that "It hurts my eyes to look at the black-board." The chapter on "Dietetics" embraces a discussion of food stuffs, the classification and uses of food, the relative values of the common foods, their proper preparation and the adulterations which they may contain. It will be seen that the subject matter is most general, and embraces practically all that is of moment in sanitary matters, while, moreover, the arrangement and treatment are most admirably suited for convenient reference. Methods of hygienic chemical analysis are given in so far as is deemed necessary, and these sections will prove particularly valuable as an aid to the interpretation of results obtained through an expert chemist.

EXCHANGES.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York]

For Sale or Exchange.—A large number of state and general government scientific reports, Smithsonian contributions and Bulletins Torrey Club, Botanical Gazette and many others. These were obtained in the purchase of a large scientific library and are duplicates. Write for what you want and offer any sum. Mexican Boundary Survey, Torrey's Botany California, Blume's Orchids of India and Japan, and Hooker's Rododendrons of the Sikkim-Himalaya are in the lot. What offers? R. Ellsworth Call, Louisville, Ky.

Skins, with full data, of Ægialites nivosa, Ereunetes occidentalis, Ammodramus beldingi, A. rostratus, Chamæa fasciata henshawi and others from California, for native or foreign skins with full data. A. W. Anthony, 2042 Albatross Street, San Diego, California.

For Sale.—An entirely new analytical balance, made by one of the most celebrated manufacturers; capacity 100 grammes, sensitive to one-twentieth a milligramme. Never been used. Regular price, $83. Will sell for $50 cash. Address, A. P. Nichols, 41 Summer Street, Haverhill, Mass.

Museum of Hamline University desires to exchange Marine Shells, preserved alcoholic material of marine zoology, or microscopic slides for zoological specimens from southern and western United States, especially for rodents in the flesh. Correspondence solicited. Address Henry L. Osborn, Biological Laboratory of Hamline University, St. Paul, Minnesota.

For Sale.—Small collection of fine first-class sets of birds' eggs; single breech-loading shotgun, gold-filled hunting-case watch and telescope. Write for list of eggs and particulars. B. S. Bowdish, Pheips, N. Y.

Wants.

Wanted.—Sachs's Text-book of Botany, 2nd English edition. Dr. Alfred C. Stokes, 527 Monmouth Street, Trenton, New Jersey.

WANTED to exchange for human bones or recent medical text-books, the following books "Metallurgy of Silver," M. Eissler, 1889; "Practical Treatise on Petroleum," by Benj. J. Crewe, 1887; "Cook's Chemical Philosophy," 1885; "Cairn's Chemical Analysis," 1880; "Wagner's Chemical Technology," by Crookes, 1886; "Fresemier's Qual. Chem. Analysis," 1879; "Elementary Treatise on Practical Chemistry and Qual. Analysis."—Clowes, 1881; bound Vols. 1 to 12 of Dr. Lardner's "Museum of Science and Art" (very rare), 1854; back numbers of "Electrical World," beautiful specimens of Pyrite Incrustations from Cretaceous of New Jersey; Magnetis Iron Ore, Highly Polarized. Address D. T. Marshall, Metuchen, N. J.

WANTED.—Books or information on the microscopical determination of blood and hair. Also reports of cases where hair has played an important part in the identification of an individual. Address Maurice Reiker, 206 N. First Ave., Marshalltwn, Iowa.

A GEOLOGIST thoroughly conversant with the geology of the Southern States desires an engagement. Has complete knowledge of the economic geology of Iron, Coal, Lignite, as well as Clay and Kaolin. Five years' experience with Geological Surveys. Address K., 509 West Sixth Street, Austin, Texas.

WANTED.—Tuckerman's Geneva Lichenum and Carpenter on the Microscope, Wiley's Introduction to the Study of Lichens. State price and other particulars. Richard Lees, Brampton, Ont.

SOME OF THE NEW BOOKS AT LOW PRICES.

FAMOUS VOYAGERS AND EXPLORERS.—$1.50.

MRS. BOLTON has added to her *Famous* series of books another and an unusually interesting volume, "Famous Voyagers and Explorers." It is hardly comprehensive, as it gives the biographies of only a few typical explorers—Marco Polo, Columbus, Magellan, Raleigh, and the more prominent of our modern American explorers. Doubtless such names as the Cabots, Sir Humphrey Gilbert, De Soto, Cartier, Nansen and others are reserved for a second volume. Mrs. Bolton has a gift for this sort of writing, and she has here brought together a large amount of deeply interesting matter which otherwise could only be obtained by reading through a dozen or more separate volumes. The book is illustrated with several portraits.—*Boston Transcript.*

OUR GREAT WEST.—$2.50.

THE contents of the volume appeared serially in *Harper's Magazine* and *Harper's Weekly*, in which periodicals they attracted wide attention and favorable comment. Their importance fully justified their republication in a more permanent form. The book affords a more minute insight into the present condition of the West than can be found elsewhere. What it tells is the result of personal experience, fortified by information obtained from the best-informed and most reliable men in the localities under discussion, and set forth with admirable clearness and impartiality. It is a work to be read and pondered by those interested in the growth of the nation westward, and is of permanent standard value.—*Boston Gazette.*

STATESMEN.—$2.00.

IN the preparation of this work Noah Brooks has aimed to present a series of character sketches of the eminent persons selected for portraiture. The object is to place before the present generation of Americans salient points in the careers of public men whose attainments in statesmanship were the result of their own individual exertions and force of character rather than of fortunate circumstances. Therefore these brief studies are not biographies. Mr. Brooks had the good fortune of personal acquaintance with most of the statesmen of the latter part of the period illustrated by his pen, and he considers it an advantage to his readers that they may thus receive from him some of the impressions which these conspicuous personages made upon the mental vision of those who heard and saw them while they were living examples of nobility of aim and success of achievement in American statesmanship.

MEN OF BUSINESS.—$2.00.

W. O. STODDARD, who has just written a book published by the Scribners, on "Men of Business," tells how the late Senator Stanford chopped his way to the law. "He had grown tall and strong," says Mr. Stod dard, "and was a capital hand in a hay-field, behind a plough, or with an axe in the timber; but how could this help him into his chosen profession? Nevertheless it was a feat of wood-chopping which raised him to the bar. When he was eighteen years of age his father purchased a tract of woodland; wished to clear it, but had not the means to do so. At the same time he was anxious to give his son a lift. He told Leand, therefore, that he could have all he could make from the timber, if he would leave the land clelar of trees. Leland took the offer, for a new market had latterly been created for cord-wood. He had saved money enough to hire other choppers to help him, and he chopped for the law and his future career. Over 2,000 cords of wood were cut and sold to the Mohawk and Hudson River Railroad, and the net profit to the young contractor was $2,600. It had been earned by severe toil, in cold and heat, and it stood for something more than dollars.—*Brooklyn Times.*

ORTHOMETRY.—$2.00.

IN "Orthometry" Mr. R. F. Brewer has attempted a fuller treatment of the art of versification than is to be found in the popular treatises on that subject. While the preface shows a tendency to encourage verse-making, as unnecessary as it is undesirable, the work may be regarded as useful so far as it tends to cultivate an intelligent taste for good poetry. The rhyming dictionary at the end is a new feature, which will undoubtedly commend itself to those having a use for such aids. A specially interesting chapter is that on "Poetic Trifles," in which are included the various imitations of foreign verse in English. The discussion of the sonnet, too, though failing to bring out fully the spiritual nature of this difficult verse form, is more accurate than might be expected from the following sentence: "The form of the sonnet is of Italian origin, and came into use in the fifteenth [*sic*] century, towards the end of which its construction was perfected, and its utmost melodious sweetness attained in the verse of Petrarch and Dante." In the chapter on Alliteration there are several misleading statements, such as calling "Piers the Plowman" an "Old English" poem. In the bibliography one is surprised not to find Mr. F. B. Gummere's admirable "Handbook of Poetics," now in its third edition. In spite of these and other shortcomings, which can be readily corrected in a later issue, this work may be recommended as a satisfactory treatment of the mechanics of verse. A careful reading will improve the critical faculties.—*The Dial.*